No. R. 1742—*Agri.* 145-06-7, *dated* 12*th September* 1908.

The following letter No. 770, dated 8th February 1907, together with its enclosures from Dr. Lehmann, Agricultural Chemist to the Government of Mysore, are herewith published for general information as they contain useful matters regarding the prospects of development of sugar industry in the State.

By Order,

K. S. CHANDRASEKHARA AIYAR,
Secy. to Govt., Gen. & Rev. Depts.

In response to Government Order No. R. 8644—Agri. 285-03-9, of 15th March 1905, I have the honour to report on the results of some of my experiments in regard to the manufacture of sugar.

2. Most of these results have already been reported on from time to time in my annual reports, and the desirability of using more modern methods for utilising the juice of the sugar-cane than those involved in making jaggory have been referred to by me on several occasions. Appended I am giving extracts from the marginally noted reports giving some of the reasons why it appears highly desirable to me that more modern machinery should be introduced into Mysore for manufacturing sugar. The substance of these extracts is in short that the imports of refined sugar are very large and rapidly increasing. In 1903-04 the imports were over 290,000 tons, an increase compared with 10 years before of 173 per cent. This rapidly growing increase can only be checked by India producing a sugar of equally good quality herself, and to do this improved machinery is absolutely necessary. The imports in 1903-04, amount to about two pounds of sugar per head of population. The increase in importations must imply a reduction in the jaggory produced in India unless the consumption of sugar per head is also increased. The present system of boiling jaggory and afterwards refining this is a *very wasteful* process. The better the machinery used, the less the loss will be. India has many natural advantages for producing sugar, and if these opportunities are made use of, could export sugar very largely instead of importing it.

(*a*) Special Report accompanying my letter No. 56, dated 23rd July 1901.
(*b*) Second Annual Report, page 6.
(*c*) Fifth Annual Report, pages 9 and 10.
(*d*) Sixth Annual Report, page 21, para 42.

3. India as a whole and Mysore in particular can grow sugar-cane of the very best quality—(21 per cent of sugar less than ½ per cent glucose). I know of no other sugar-cane to equal our best. The outturn per acre can be materially increased with proper cultivation. Labour is cheap. The chief drawback to the industry flourishing and sugar being exported instead of imported is the lack of anything approaching modern machinery in its manufacture. The larger and more modern the machinery used the more completely would be overcome the immense losses now sustained by jaggory boiling and the conversion of that into refined sugar. The ordinary country mill when used to its best advantage leaves as a rule over 26 per cent of the total sugar in the refuse. Over a quarter of the sugar grown is therefore lost by imperfect milling when the ordinary bullock mill is used. A mill of this sort will crush between one hundred weight and two hundred weights per hour, and as a rule three pairs and some times six pairs of bullocks are used for each mill one working while all the other pairs are resting.

4. With a somewhat larger and better made mill driven by an engine the loss of sugar is reduced from 26 per cent to about 18 per cent, and a six-horsepower engine running it will enable it to crush about 1 ton of cane per hour. The expense of running such a mill with an oil engine will be about five rupees per day and as it will do 10 to 20 times as much work as an ordinary cattle mill, these five rupees will pay when used in this way for the work done by about 60 pairs of bullocks and about forty coolies per day when using the ordinary country mill. In other words, the crushing of the cane with the larger mill will cost about *one-eighth* or *one-tenth* of what it would cost with the country mill besides saving at the rate of about 40 maunds of jaggory or about 50 Rs. per acre on the extra weight of sugar extracted from the cane.

5. With still larger mills the saving is still greater and with the largest mill I know of all but 7 per cent or 8 per cent of the sugar in the cane are expressed. But these very large mills require such a large area of sugar-cane to keep them working, that for the present they could only be employed to the best advantage in two or three places in Mysore. But somewhat smaller mills would be of immense benefit and could be generally used. What has been said about mills applies to a greater or less degree to all the other appliances found in a sugar house.

6. As pointed out in my second annual report, the loss from decomposition of sugar when boiling down the juice of sugar-cane is very great in Mysore, in some instances amounting to over 20 per cent. This is due to boiling down the juice in an open pan over a "direct" fire and to improper liming. Fermentation is also a great source of loss of sugar. With [illegible] methods and modern machinery this loss can be almost

with which it is mixed. But in order to make a good quality of sugar and get as large a quantity of it as possible from a given weight of cane, a number of other processes are necessary. The juice has to be properly limed, the impurities thrown down by the lime have to be separated out, the scum formed on the surface of the juice when boiled up has to be removed and passed through a filter press, any excess of lime if added has to be removed and the juice has to be boiled down as quickly as possible and at the same time at as low a temperature as possible to the point at which the bulk of the sugar crystallises out so as to prevent decomposition. To remove all these impurities reduces of course the gross weight of the sugar produced. The molasses can however sometimes be used for other purposes. But even considering the molasses to be of no value it is much more profitable to remove these impurities than to let them remain in the finished products. Jaggory sells on an average at about one anna a pound. The average value per pound of the imported sugar as given by the "Customs Returns" is very nearly 1½ annas per pound, and the retail price of that sugar is very nearly two annas a pound. Out of the juice which would give 100 lbs. of jaggory of good quality I have made from 80 to 87 lbs. of centrifugalled sugar. And, notwithstanding that with the present appliances, I have not been able to remove all the impurities separated by the lime and that the sugar was therefore darker in colour and not quite as pure as it would otherwise have been, I sold it for 1½ annas to 2 annas a pound and some of it was over 98 per cent pure. This would imply that when making sugar instead of jaggory the total return would be from 25 per cent to 50 per cent more than when making jaggory; and as the profit begins after all the expenses have been deducted, and it is not much more expensive to make centrifugalled sugar than jaggory, the profits must be *immensely* greater when making the centrifugalled sugar. I might add that since writing my report for 1904-05 the imports of refined sugar for that year and the last one have been published. During 1905-06 the total imports of refined sugar into India were 368,355 tons valued at Rs. 7,22,25,947, an increase of 28·39 per cent in value and 26·39 per cent in weight in these two years. If the people in Mysore have used imported sugar at the same rate as the other people in India have done this would indicate that last year the sugar imported into Mysore was 6,932 *tons* or a little over 2·8 lbs. per head, costing Rs. 13,59,393. Based on the same calculations the imports into Mysore were in 1894-95 less than 2,169 tons and Rs. 2,33,764. This is equivalent to an increase of 481½ per cent in value in 11 years and nearly 9 per cent in value and 14½ per cent in quantity in the last year. With proper machinery it would be easily possible not only to keep all this money sent to foreign countries for sugar in Mysore but to export sugar in considerable quantities at a handsome profit. Besides improving the manufacture of sugar, the introduction of comparatively modern machinery would also improve the jaggory manufactured in the country for such time as jaggory would be continued to be manufactured.

8. To boil the juice of sugar-cane into jaggory and to refine that afterwards is a very wasteful method of making refined sugar. Because in the first case by so doing, a large portion of the water evaporated when boiling down the juice to jaggory has to be added again afterwards to make it possible to remove the impurities contained in the jaggory and afterwards this water has to be again evaporated. The fuel used in that operation is therefore practically wasted; for these impurities could be removed before boiling down the juice to jaggory. And to remove these impurities after the juice has been boiled down to jaggory also implies a comparatively heavy and unnecessary expenditure in bone char. Besides these and a few other losses which are necessarily connected with the refining of jaggory the method as employed as at present includes all those losses which apply to jaggory making as such.

9. Considering all this it is surprising that the refining of jaggory has ever paid. And the fact that refineries can exist and use more or less sugar-cane jaggory for refining purposes proves more conclusively than any estimates which could be prepared that it must pay handsomely to produce so-called refined sugar directly from the cane, provided sufficient sugar-cane can be grown within a reasonable distance of a sugar factory to keep it in work for two or three months in the year. The larger such a factory is, other things being equal, the more economically it can work. But unfortunately at present neither the area of sugar-cane cultivated by any one man in any spot in Mysore, nor the capital at the disposal of the average cultivators will permit of the erection of a *large* modern sugar house. But *small* sugar houses dealing with from 40 acres to 200 acres of cane or even more could be established to great advantage in many parts of Mysore if those who have the necessary capital could increase the area cultivated or the less wealthy would form a company.

10. At present there are however very few cultivators who are able to grow more than 10 acres or 15 acres of sugar-cane. One of the chief reasons for this is that they are unable to mill and boil more cane than can be grown on that area with the appliances at present at their disposal. It is practically impossible to mill more than one acre of good sugar-cane with a single cattle mill as ordinarily used in one month's time, and as most of the varieties of sugar-cane deteriorate materially when allowed to remain growing for more than a month or six weeks after they have reached their maximum sugar contents it would take six or seven of the ordinary bullock mills to crush the cane which could be grown on 10 acres of good land in the time during which the cane remains at its best, and that number of mills is about the maximum for which even comparatively wealthy land-owners can supply the necessary bullocks.

11. With the machinery in use at present the area of sugar-cane grown by any one proprietor is therefore practically limited to about 10 or 15 acres. With even a very small sugar house based on only moderately modern methods the smallest area which would suffice to keep

that sugar house working *to advantage* for say two months in the year would be about 40 or 50 acres. It would therefore require the co-operation of several cultivators of sugar-cane to supply the demands of such a sugar house unless the cultivators are so confident of the success of a modern sugar house that they are prepared on the strength of that confidence to suddenly and very materially increase the area under sugar-cane and it is hardly to be expected that such confidence can be established in the minds of the cultivators by any Department of Agriculture if they are not in a position to show the machinery at work and prove by ocular demonstration that what they claim can in reality be done.

12. I think I have given sufficient figures to show that the people of India want a very large quantity of so-called refined sugar and that this demand is growing enormously. That the present system of boiling jaggory with the appliances at the disposal of the raiyats is very wasteful and that furthermore the practice of refining jaggory is wasteful in itself and that such methods are not likely to stem the tide of imported sugar in the future any more than it has done in the past.

13. I think I have also given sufficient evidence that the manufacture of sugar directly from the cane must be profitable and highly profitable.

14. The machinery in a modern sugar house is no doubt expensive. But the total cost of the mill is returned in a year by the extra amount of sugar it extracts from the cane and the engine will be repaid in two or utmost three years by the reduction in the expense of milling the cane. Just how long it will take to repay the other machinery by the increased profits I cannot state definitely at present. But probably it will be paid for as quickly as the mill and engines. This applies of course to machinery run intelligently for about two months a year continuously.

15. I hope I have pointed out sufficiently the improvements which can be brought about by more up-to-date machinery and methods in the Mysore sugar-cane industry to make it appear highly desirable to give the raiyats a chance of seeing such machinery at work, and learning for themselves what can be done with it. It is partly for that reason I should like to have a complete sugar house on the Experimental Farm at Hebbal. But another and equally weighty reason is that I should like to have a chance of experimenting further on the methods of sugar making and testing what methods would probably give best results in Mysore. For as in Mysore the conditions are not the same as in other sugar-producing countries we must make our own experiments in the manufacture of sugar as well as in other things.

16. But there is third reason as important as either of the other two which makes it desirable to have a sugar house capable of treating a much larger quantity of sugar-cane in a month or so than we shall ever be able to grow on the experimental farm, and that is, that in order to be able to conduct plot experiments with sugar-cane all the plots in one set of experiments must be practically cut at the same time, and in order to be able to do this it is necessary to have a very much larger sugar house than would be necessary for ordinary purposes.

17. I have 15 estimates for various sized sugar houses specially prepared for me by various manufacturers. They vary from Rs. 16,000 to Rs. 1,29,000 in price and in capacity from 1 ton of sugar a day to 4 tons per day. But the kind of machinery in them varies even more than the price and capacity; some of them are almost miniature modern sugar houses. Others small sugar houses as they were met with fifty years or more ago. None of them has however a nine-roller mill, such as I think we ought to have for our experimental work.

In the Experiment Station at New Orleans, in which I was Chemist 15 years or so ago, we had about 20 acres of land and on it a sugar house which would probably cost now Rs. 1,00,000. But in it were a diffusion plant as well as a nine-roller mill and a number of other machines were present in duplicate.

The sugar house which, it would, in my opinion, be highly desirable to have on the farm, would cost probably about Rs. 40,000 or Rs. 50,000. This would also provide for a number of machines being in duplicate for experimental purposes. But as such a sugar house can be equipped in stages and as I know there is a very heavy demand on the State Funds, I request that Rs. 20,000 be included in my next year's budget to enable me to get the most important machinery, and that the other machinery be added as circumstances permit. Should Government desire me to give the experiments on which the estimates of the losses sustained by the present method of jaggory boiling have been based in greater detail I shall of course be delighted to do so.

ENCLOSURES TO THE ABOVE.

(1) *A note on the Mysore Sugar Industry.*

When appointed to my present position one of the duties imposed on me was to try to revive decaying industries in Mysore. In trying to fulfil this part of my duty I have given special attention to the sugar industry. I did so because on the one hand through the assistance of Government the silk industry was already being investigated by specialists, the representatives of Mr. Tata, and because on the other hand the sugar industry is one of those industries of Mysore in which I have had much practical experience before coming here.

No doubt many would resent the idea that the sugar industry is in the process of decay, as it has been carried on in much the same way as at present for the past six hundred years or more; that, in fact, it has been improved upon, because for one thing quite recently iron mills have taken the place of the old wooden mills and much better extraction of the juice is being obtained. But when viewed in the light of the progress made in other countries, and when the relative position of India as a sugar producing country six hundred years ago and its present position are compared there can be no doubt that the sugar industry is one of those decaying industries which it is in the interests of the State to revive. In fact the native refining industry is already practically dead, so far as I could ascertain, in Mysore. So-called refiners are still engaged in the bazaars and sell so-called native refined sugar. This is, however, nothing but sugar refined in the large factories, imported into the State and remelted in the bazaars to give this sugar the appearance of native-refined sugar; and to overcome the objection existing to sugar refined with charcoal, the so-called native refined sugar is therefore sold under false pretensions.

The fate which has overtaken the native refining industry is sure to overtake the jaggory boiling industry sooner or later. In fact the sooner the jaggory boiling is abolished the sooner the sugar industry will regain some of its former splendour. Of course the methods of cultivating the cane will also have to be improved. But of this I shall speak on some other occasion. At present I shall only attempt to prove that jaggory boiling is one of the prime factors retarding the sugar industry, and make some suggestions for the removal of this barrier.

In jaggory boiling as at present carried on in the Kunigal, Krishnarajpete and Seringapatam Taluks there is a loss varying from 10 per cent to 22 per cent of the weight of the jaggory in refinable sugar. In other words, the same quantity of sugar-cane which produced 100 lbs. of jaggory from which 50 to 62 lbs. of refined sugar could be obtained could give, if manufactured directly into refined sugar by improved machinery, about 70 to 75 lbs. of refined sugar. That such a loss may make all the difference between a flourishing industry and a crippled one is self evident. But to this loss must be added the expense of the fuel used for boiling the jaggory and many other items; for the fuel used to make the jaggory is largely wasted if the jaggory has to be remelted and refined and the cheap fuel used for this purpose such as the begasse (the expressed cane stalk) and jungle wood has to be replaced by the more expensive fuel used in the refineries. There are many other drawbacks and losses in jaggory boiling. But these cannot be taken into account here especially as they are to some extent at least offset by drawbacks in whatever other system might be introduced. But the loss of on an average 15 lbs. on every 75 lbs. of refinable sugar is so serious that, I think, it justifies almost any effort made to save it. This loss may be partially overcome by improving the present system of jaggory boiling. To what extent I cannot say definitely. But as soon as I am in a position to do so I shall make experiments in the laboratory, to save as much of this loss as possible by making various improvements to meet the different circumstances of the present sugar producers. But so long as jaggory boiling is continued this loss must go on to a very large extent as has been proven by all the leading sugar producing countries having abandoned long ago all systems which were in any way similar to that in vogue here.

Six hundred years ago India was the leading sugar exporting country, and sugar was known in England as Indian salt. Now instead of exporting India imports thousands of tons of sugar every year largely from Germany. This is not because Germany is naturally in a better position to produce sugar, but because it has been devoting perseverance, skill and capital to this industry. Naturally Germany possesses no advantages in producing sugar over Mysore. In Germany sugar is made from beets instead of cane. The percentage of sugar in the juice of beets is, if anything, slightly inferior to that from cane. To extract the juice from the beets is more complicated than extracting it from cane. To make sugar from beet juice is much more difficult than making it from cane juice, because, the beet juice has many more impurities than cane juice and as these impurities have a very disagreeable taste they must be entirely removed before the sugar can be used even for culinary purposes while the impurities of sugar-cane juice are not unpalatable and absolute purity of the sugar produced from it is therefore in many cases not necessary. In addition to this the yield of sugar beets is very considerably less per acre than cane and the cultivation required decidedly more than that necessary for sugar-cane. On no point does the sugar beet possess advantages superior to cane and in most respects it is decidedly inferior to the sugar-cane. In addition to this the wages paid the ordinary working man in Germany is much higher than that paid the coolies in India, labourers there receiving about Re. 1 per day. What then is the reason that the Germans can pay the freight on their sugar to India and still compete successfully with the Indian sugars in their own market. It is simply that they manufacture it on the large scale, use the most approved machinery which they have invented themselves; study to avoid every loss of time and material and have skilled men in charge of every operation. If we successfully learn the lessons they are teaching us and act upon them there is no reason why India should not export sugar to Germany if no tariff restrictions prevent it.

In Louisiana frost almost invariably kills the sugar-cane prematurely or rather necessitates its being cut prematurely, and as a result the juice contains more impurities and less sugar than here, and the price of labour (no better than that given by the coolies here) is from Rs. 2 to Rs. 3 per day. Even under such disadvantages the large factories would be able to compete with the German sugar if unprotected by either bounty or sugar duty. Cuba, the dreaded

rival of the German sugar manufactures, was hampered with heavy excise taxes paid to the Spanish Government and by inferior cultivation of the cane. For the present the late war has ruined its finances. Jamaica has, I am told, the same primitive methods it had fifty years ago, and is no longer a sugar-producing country of note. Demarara labours under the expensive system of having to pump out surplus water from its fields, some of which are below the level of the sea and keeping up an expensive system of dams. Mysore has undoubtedly a disadvantage in having a comparatively long dry season necessitating irrigation. But this disadvantage is comparatively insignificant when viewed with those mentioned above, and Mysore should therefore be in a position to compete with any of these countries, especially so in the markets of India.

There is no doubt then that Mysore can take a leading part in the sugar industry if it can follow the methods practised in those countries leading in this industry at present. But, as I said before, in none of them is any system of sugar boiling practised which resembles our own. It is of prime importance that marketable sugar be produced directly from the cane and that all the care possible be exercised to prevent loss of either material or time. To do this improved and expensive machinery is necessary, and, as in most manufacturing industries, the larger and more expensive the plant the more economically it can be made to work. Of course the scattered position of the sugar-cane fields in many parts of Mysore as well as the limited capital at the disposal of those who might be willing to form a company to build a modern sugar house will prevent for the present such large sugar houses being built as are frequently met with in other countries. But as it would not be difficult to find many places in which 100 acres or 200 acres or even double this number of acres of sugar-cane could be grown within a radius of four or five miles, sugar houses dealing with 100 or 200 acres of cane could be very profitably established. These would cost between Rs. 1,00,000 and Rs. 2,00,000, and ought to pay for themselves in a short term of years. Such sugar houses are something quite distinct from refineries. They turn out a fairly white sugar without the use of charcoal and are in many respects simpler than refineries. But as this process of manufacturing a good marketable sugar direct from the cane without the use of charcoal, is practically unknown in India, I request Government to kindly consider the possibility of putting up such a sugar house for demonstration purposes. I have no doubt that if properly located and worked there will be a considerable profit even in the pioneer plant, and have no fear that it could not be disposed of without loss. In fact one native gentleman, Mr. Sabapathaiya, has already promised me that if Government would put up such a sugar house on his estate near Bangalore he would guarantee to have 100 acres of sugar-cane within the radius of five miles or less to be worked up in such a sugar house and promised to take over the plant at the expiration of one or two years at its cost price. No doubt other gentlemen, either native or European, would be glad to avail themselves of such an opportunity. Mr. Young of Nyamati for one, is, I know, also anxious to avail himself of such an offer if he can find the necessary funds.

In conclusion permit me to repeat that if the sugar industry is to flourish, such factories must be established. The plan on which the capital to erect them is to be provided may differ. It may be that the raiyats themselves club together like the farmers in Canada have done to build cheese factories; that companies of raiyats and others be formed; that either outside companies or individuals build these central factories or sugar houses and buy the cane from the raiyats; or sugar planters be found who own the lands, cultivate them themselves and build their own sugar houses as in Louisiana. But while it is absolutely necessary to have these larger sugar houses if the industry is to flourish, there must invariably be some raiyats so situated that they cannot avail themselves of these advantages; and for these simpler plans will have to be worked out. So while most strongly urging Government to consider the possibility of building such a factory as referred to above, I shall by no means consider that that is all which is required to be done. Finally, permit me to state that the sooner such a work is taken in hand the better it will be. For one thing Cuba, formerly the largest cane-sugar-producing country, will be sure to revive from the temporary depression the war has created, before long, and as the heavy taxes imposed by Spain before the war have been removed, it will be producing more sugar than before the war.

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(2) *Extract from page 6 of the Second Annual Report.*

Jaggory versus *Raw Sugar.*—So long as jaggory boiling is continued, it is, of course, necessary to make it as profitable as possible for the raiyats engaged in it. But the aim should be to replace this method of utilising the sugar-cane as soon as possible by a rational system of sugar making.

No doubt, there will remain in India a market for jaggory for generations to come. But this market will no doubt continue to grow smaller and smaller, while the market for the various forms of sugar will continually increase. If this be the case, it is evident that if India is to retain the position it holds at present, it must increase its supply of sugar at the expense of jaggory. To do this by refining jaggory is certainly a wasteful method; because—

(*a*) In jaggories numerous impurities are retained which could be easily removed if the juice were boiled into raw sugars, but are more difficult to remove later on.

(*b*) The better grades of raw sugar would be equal to the poorer grades of refined sugar in the market at present, (as a matter of fact, sugar can be made directly from the juice without bone char equal to the best grades of refined sugar. And such sugar is being made in America). The cost of refining such sugars will therefore be saved.

(*c*) It is easier and cheaper to refine such raw sugars as may require refining than to refine the average jaggories, and this saving will more than compensate for the extra expense in making the raw sugars.

In order to retain the present extent of cane cultivation, it is therefore better to boil the juice directly into sugar than into jaggory as done at present.

It is, however, a low ambition to simply retain the present position of the sugar industry, when India is importing sugar on such a large scale as it does. Deducting the exports from the imports for the past year, there remains a net import of sugar to the extent of over 130,000 tons. In other words, it would take a railway train covering over 35 miles of track, car touching car, to carry this sugar, or one train composed of 24 car-loads of sugar would have to run every day of the year to take away the sugar from the steamships as they come in.

This import takes place into a country which may be considered as the original home of the sugar industry; into a country which possesses, in some respects at least, great advantages for the production of sugar over the countries from which the sugar is imported. India ought certainly to be able to produce this sugar at home. But if it is necessary to partially abandon jaggory boiling in favour of raw sugars in order to simply retain that portion of our own sugar market, we possess at present, how much more important when we wish to regain a portion of our own markets we have lost For the sugar imported is of the better grades. We pay for it a little over Rs. 10 per hundredweight and for that we have exported we get considerably less than Rs. 6 per hundredweight.

A general opinion is that the raiyats of India are too poor to make any improvements in their methods. Still they can afford to lose considerably over 4 annas on every 16 annas' worth of jaggory they produce (which they might save without any extra outlay), and the people as a whole can afford to pay over 292 lacs of rupees to foreign countries for sugar which might be grown at home.

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(3) *Extract from the Fifth Annual Report, (para 28).*

The aim of those interested in sugar-cane growing will have to be directed to the production of raw sugars instead of jaggory. Notwithstanding that the present methods of jaggory-making are capable of considerable improvement, the sugar industry must gradually decline if jaggory is made instead of raw sugars. In order to replace, or even to compete with the sugar at present imported in such large quantities into India, we must produce a sugar which can be easily refined. For refining purposes it is infinitely better to produce raw sugars than jaggory. And unless this is done, the sugar industry must decline with the gradually declining consumption of jaggory as such. This season it was only possible to produce one sample of raw centrifugalled sugar at the Laboratory. It contained 94·1 per cent of sucrose and 2·45 per cent of glucose. It is hoped that next season will give opportunities of doing more in this line of work.

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(4) *Extract from the Sixth Annual Report, (para 42).*

A large and greatly increasing quantity of sugar is being imported to India every year. In 1893-94 this quantity was a little over 106,000 tons. Five years later the import had nearly doubled, being nearly 204,000 tons; and last year it was a little over 290,000 tons, which is an increase of over 42 per cent in these last five years. This import amounts to nearly 2 lbs. per head of population, and must represent a very considerable part of the total sugar consumption of India. These imports now come chiefly from Mauritius and Java, and less than 27,000 tons came last year from beet sugar-producing countries. That such a large and increasing import of sugar takes place, shows conclusively that there is something radically wrong with the Indian sugar industry. As far as Mysore is concerned, this "something" is certainly not to be found in the quality of the cane. For I know of no other country in the world in which sugar-cane is grown which contains 20 and 21 per cent of sucrose as it does in Mysore at times. The quantity of cane per acre should of course be improved. But probably there is no part of the industry which requires greater improvement than the manufacturing side. The milling of the cane, the liming, the removal of scum when boiling and the guarding against loss from fermentation of the juice are factors which require careful attention. But as the sugar imported is either refined or goes to the Indian refineries to be refined before being placed on the retail market, it is evident that in order to compete with this imported sugar we must treat our cane juice in such a way as to produce in the most economic way high grades of

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sugar. And we are unable to do this as long as we produce jaggory first, and send that to the factories to be refined. The fuel used to boil down the juice to jaggory is practically wasted, and the char filters and other parts of the refineries are given infinitely more work than need be if the molasses is not removed from the sugar before the latter is refined. Moreover the best grades of raw, centrifugalled sugar manufactured in the districts could be of a sufficiently high quality to be able to replace directly a part of the imported sugar. Jaggory would be unable to do this. As the universal experience is that refined sugars gradually replace the lower grades of sugars in the market, it is self-evident that as long as jaggory continues to be the chief product of the sugar-cane, the sugar industry is bound to decline unless a jaggory can be manufactured which is eminently suited for refining purposes. And as, for the reasons given above, this is not likely to be the case, it is necessary to replace jaggory boiling by more modern methods and to produce as good a quality of raw sugar as the circumstances will permit if the imported sugar is to be replaced in the Indian market by that produced in the country. India is the home of the sugar industry, and when sugar was first imported into Europe it was known by the name of "Indian salt." But the methods which were eminently successful 700 years, or even 150 years ago, cannot compete with modern appliances in an industry in which such advancement has been made as in sugar boiling. Sugar has dropped very much in price. When first imported in large quantities into Europe it was sold for a price considerably over Re. 1 per pound. In fact only about 100 years ago it was sold, for a short time, for well over Rs. 2 per pound on the continent of Europe; but this excessively high price was due to great restrictions having been placed on trade with sugar in continental Europe. The present comparatively very low price is in a great measure due to better and cheaper methods of production, and in order to compete, even in our own markets with countries employing these cheaper and better methods of productions, we must improve our own methods. If their methods are not applicable here we must make our own improvements; but improvements we must make if we want to keep a sugar industry.